Letter of Transmittal

Horizon ENGINEERING, LLC

Date: 1/13/10

To: Kentucky Division of Water
Attn: Jesse Robinson
200 Fair oaks, 4th Floor
Frankfort, KY 40601

From: Horizon Engineering, LLC
Robin P. Mills, P.E.
111 North Second Street
P.O. Box 364
Bardstown, KY 40004

Proposed Thomas Nelson High School: Nelson County, AI # 105306:

Please find attached:

Copy of submittal to Army Corp of Engineers.

Sincerely,

Robin Mills, P.E.
Principal Engineer

RECEIVED
JAN 14 2010
WATER QUALITY BRANCH

Horizon
ENGINEERING, LLC

January 12, 2010

U.S. Army Corps of Engineers
Attn: Jennifer C. Thomason
P.O. Box 59
Louisville, KY 40201-0059

RE: Thomas Nelson High School
Highway 245
Bardstown, KY 40004

Dear Ms. Thomason,

I have attached the additional information requested for the lake modifications at the Thomas Nelson High School site near Bardstown, Kentucky, along with a copy of the original application. Please feel free to give me a call if you have any questions or need additional information.

Sincerely,

Robin P. Mills

Robin P. Mills, P.E.
Principal Engineer

• Phone: (502) 348-4330 • Fax: (502) 348-4340

-ORIGINAL APPLICATION-

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT *(33 CFR 325)*	OMB APPROVAL NO. 0710-0003 Expires December 31, 2004

The Public burden for this collection of information is estimated to average 10 hours per response, although the majority of applications should require 5 hours or less. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection , Research and Sanctuaries Act, Section 103, 33 USC 1413. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE *(an agent is not required)*
Nelson County Board of Education	Horizon Engineering, LLC
6. APPLICANT'S ADDRESS 288 Wildcat Lane Bardstown KY 40004	9. AGENT'S ADDRESS 111 North Second St., P.O. Box 364 Bardstown, KY 40004
7. APPLICANT'S PHONE NOS. W/AREA CODE a. Residence b. Business (502) 349-7000	10. AGENT'S PHONE NOS. W/AREA CODE a. Residence b. Business (502) 348-4330

11. STATEMENT OF AUTHORIZATION

I hereby authorize, Horizon Engineering, LLC to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT'S SIGNATURE — DATE: 8/17/09

NAME, LOCATION AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE *(see instructions)*
Thomas Nelson High School

13. NAME OF WATERBODY, IF KNOWN *(if applicable)*	14. PROJECT STREET ADDRESS *(if applicable)*
Existing 1.5 Ac. lake	Highway 245 Templin Ave. Bardstown

15. LOCATION OF PROJECT
Nelson (COUNTY) Kentucky (STATE)

RECEIVED
JAN 14 2010
WATER QUALITY BRANCH

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN, *(see instructions)*

17. DIRECTIONS TO THE SITE From I-65 South out of Louisville, take the Bardstown/Clermont exit. Turn left off of exit ramp onto Hwy. 245 toward Bardstown. As you near Bardstown, you will pass Hardy Food Mart & road begins to widen to 5-lane. Travel ± 1500' past the entrance to Stonehouse Rd. to the entrance to Templin Ave, a small frontage road. Turn

18. Nature of Activity *(Description of project, include all features)*

Existing lake will be modified to accommodate detention & irrigati for new house school. Dam is in poor condition; therefore, it will be tore out & rebuilt. Dam will be raised ≈ 5'. Bottom of lake will be provided with geomembrane liner to prevent leakage.

19. Project Purpose *(Describe the reason or purpose of the project, see instructions)*

Irrigation lake for high school athletic fields.
Detention for new high school campus; Existing culvert for fence crossing

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

Reconstruction of lake to accommodate irrigation for new high school facility, existing culvert added to provide fenced area around lake for safety.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

≈ 3000 cubic yards to be removed; including bottom of lake & existing dam
≈ 1000 cubic yards fill for clay core, ≈ 1500 cubic yards silt or topsoil

22. Surface Area in Acres of Wetlands or Other Waters Filled *(see instructions)*

Approximately 1/2 acre will be filled in area of existing dam & new culvert for fence

23. Is Any Portion of the Work Already Complete? Yes ____ No ✓ IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list).

E. Gene & Vickie A. Bell
289 Stonehouse Rd.
Bardstown, KY 40004

25. List of Other Certifications or Approvals/Denials Received from other Federal, State or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
Nelson County Engineer	Drainage	N/A	7/28/09	8/12/09	

*Would include but is not restricted to zoning, building and flood plain permits

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE
[signature]	8/17/09	[signature]	8-14-09

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Horizon
ENGINEERING, LLC
111 North Second Street
Bardstown, Kentucky 40004

THOMAS NELSON HIGH SCHOOL
2885 NEW SHEPHERDSVILLE ROAD
BARDSTOWN, KY 40004
NELSON COUNTY BOARD OF EDUCATION
BARDSTOWN, KENTUCKY

NARRATIVE FOR MODIFICATIONS TO EXISTING LAKE:

BACKGROUND & PURPOSE:

As part of the project by the Nelson County Board of Education, in construction of a new high school facility, there is an existing lake on the site that will be reconstructed to allow for storwater control from the site and also as irrigation for the new athletic facilities. From reviewing USGS maps, the existing lake shows up on the 1979 edition of the Cravens 7.5 minute USGS topographic map. The existing lake covers approximately 1.2 acres and has been used primarily for agricultural purposes. Preliminary measurements indicate that the existing lake is 8'-10' deep. The drainage area that discharges into the lake is approximately 167 acres. Of the existing drainage area, approximately 30 acres is existing residential development and the remaining is agricultural land. The coefficient of runoff assigned to the area is a composite number of 0.29, with 0.4 being assumed for the residential area and 0.26 being assumed for the agricultural land. There is another existing lake approximately 1000 linear feet upstream of the school's lake on property owned by Dennis & Jan Tronzo. Downstream discharge travels approximately 300 feet through wooded, steep terrain on the school property and exits into the existing drain on property owned by Gene & Vickie Bell. The existing drain is wooded and eventually discharges into Buffalo Creek, which drains directly into Sympson Lake. Sympson Lake is the water source for the City of Bardstown.

To effectively use the lake for stormwater and irrigation, modifications have to be performed to the lake and the dam. Inspection of the lake shows that the dam is in fair condition. There is currently not a principal spillway for the lake. There is an emergency spillway on the west side of the lake to allow lake overflows during heavy rains without overtopping the dam. The spillway discharges into a natural drain with a normal flow width of approximately 2'. It is believed that the lake has silted up over time, with local residents recalling the lake being 12'-15' deep at one time. To ensure stability, we are proposing to rebuild the dam for the lake. We are also proposing to remove the excess silt from the bottom of the existing lake and provide a geomembrane liner in the bottom. The excess silt will need to be removed to provide an appropriate bearing surface for the proposed liner. The liner will ensure that the proposed disturbance to the lake sides and bottom will not create any new leaks from the lake. The proposed dam will be raised approximately 3' from the highest point of the existing dam to allow for storage of stormwater during heavy rains and to allow for freeboard in the emergency spillway. A principal spillway is also being proposed as part of the lake modifications.

In addition to the dam reconstruction, a crossing is being proposed across the existing drain just upstream from the lake. The school owns remaining property on the west side of the drain that will need to be accessible for maintenance and mowing. The school is also proposing a full perimeter security fence around the lake to limit students at the proposed school from access to the lake. This crossing will enable access to their remaining property and also provide a means of securing the lake, without placing fencing within the limits of the drain.

Proposed Construction Details:

It is estimated that approximately 2500 cubic yards will need to be removed from the existing lake bottom. A minimum of 12" of material over the entire area of the lake (1.2 acres) will account for approximately 1900 cubic yards. Additional material will need to be removed in the area next to the dam, where excess silt has accumulated over the years, bringing the estimate up to 2500 cubic yards. The normal pool area will increase in width by approximately 20' and in length by approximately 10'. The entire length of disturbance

along the stream for the lake and proposed dam area is approximately 720 linear feet. The existing length of the lake and dam is approximately 610 linear feet.

The existing dam will need to be removed and rebuilt. The existing dam is approximately 60' wide at the base of the widest point, 15' wide at the top and varies from 10'-12' tall at the tallest point. The existing dam is approximately 160' in length with a 20'-30' wide emergency spillway. Approximately 500 cubic yards will be removed with the existing dam. A key will need to be excavated for the proposed dam to solid rock. This will remove approximately 75 cubic yards of material.

The proposed dam will be built with a solid clay core and topped with silt and topsoil, suitable for vegetation. The proposed dam is 85' wide at the base of the widest point, 10' wide at the top and approximately 15' tall at the tallest point. Approximately 1000 cubic yards of clay will be needed for the core and approximately 1500 cubic yards of silt or topsoil will be used to top the clay core to construct the dam to proposed dimensions. The proposed dam will be built with a principal spillway consisting of a 48" high density polyethylene drain pipe, a 8'x8'x8' tall concrete structure constructed with a 8' wide x 3' deep weir to allow for 3' of stormwater storage in the lake and an outlet headwall. The concrete structure will have a solid concrete top with an access manhole and steps. The outlet headwall will be supplied with energy dissipators and a safety grate. The dam will be constructed with a 25' wide x 2' deep emergency spillway. The spillway will allow 12" freeboard above the maximum anticipated flow to the top of dam to allow for passage of all stormwater without overtopping the dam. The emergency spillway will be finished with rip-rap an average of 20" diameter. Shot rock may be used as rip-rap for the spillway and outlet channel. An outlet channel shall be constructed from the spillway along the toe of the downstream dam slope that is 15' wide x 24" deep and extend 40' beyond the outlet of the principal spillway, the 48" outlet headwall. The minimum lake bottom elevation is 630.0'. The top of dam elevation is 645.0'. The normal lake pool/weir elevation is 640.0'. The emergency spillway elevation is 643.0'. The outlet elevation of the 48" principal spillway is 632.0'.

The crossing constructed upstream of the lake shall consist of a 56' long, 72" diameter equivalent concrete outlet pipe with safety inlet grate and apron. The fill over the concrete culvert shall be approximately 60' wide at the base of the widest point, 10' wide at the top and 7.5' tall at the tallest point. The approximate amount of fill required for the crossing is 400 cubic yards. The crossing will be finished with topsoil to allow vegetation on the slopes of the crossing. The proposed crossing will disturb approximately 60 linear feet of the existing drain.

Any excess material will be disposed of in the area designated on the west side of the existing drainway. Spoil material from the lake will be spread out on the slope and allowed to dry. Slope will be finish graded, spread with topsoil and seeded with straw mulch.

Methods of Construction:

See attached narrative from Kelsey Construction, LLC for specific instructions on methods of construction and estimated time to complete each phase of the construction. It is estimated that total construction time on the lake will be 5 ½ to 6 weeks. Estimated construction time will begin on June 15th and will be completed by August 1st.

Mitigation and Restoration:

Bottom of lake shall receive geomembrane liner once dam is completely rebuilt. Slopes above liner shall be seeded with straw per specifications. All exposed dam and crossing slopes shall be 3:1 minimum. Slopes shall be prepared for final seeding per project specifications. All 3:1 slopes and steeper shall be applied with erosion control blankets to

hold seed in place while vegetation is established. Emergency spillway, toe of dam slope and principal spillway outlet shall be stabilized with rip-rap. Rip-rap shall be an average of 20" diameter. Shot rock may be used for rip-rap.

See attached sketches for specific lake, dam and crossing details. Photos of the area are also included.

Kelsey
Construction LLC
Utilities and Commercial Development

Horizon Engineering, LLC
111 North Second Street
P.O. Box 364
Bardstown, KY 40004
Attn: Ms. Robin Mills
Phone (502) 348-4330
Fax (502) 348-4340

January 11, 2010

RE: Thomas Nelson High School – Nelson Co. – Bid Pkg. 01

Subject: Procedure to drain pond, remove, reconstruct dam, grade, install geo-membrane system and stabilize by seed straw and protective measures in existing pond area.

Dear Robin,

I am writing the following narrative, per your request, to describe the ways and means that Kelsey Construction, LLC has planned to remove and rebuild the existing on-site pond on the Thomas Nelson High School project.

1. A course aggregate check dam / stilling basin will be installed south of the existing dam and above the contributory of the creek. Stilling basin to be 25'to30' x 15'to20' with the deepest end being 6' and the upper shallow end being @ 2'
   - Excavation, Grading and Aggregate to be performed using an Excavator and Articulated Dump Truck.
   - 4 hr. duration
2. The pond water elevation will be released into the check dam / stilling basin.
   - Action will be performed using an Excavator.
   - Approx. 16 hours (2 days) to release water.
3. The existing pond dam will be breached and removed.
   - Action to be performed using an Excavator, Articulated Dump Trucks and D6 Dozer
   - Approx. 24 hours (3 days) to remove dam.
4. The pond will be mucked and the proposed keyway will be blasted and excavated.
   - Blasting of keyway performed by Furwakawa rock drills and Licensed Blaster and Crew.
   - Approx. 24 hours (3 days) to drill and blast and will be done in conjunction with mucking operations.
   - Mucking performed by Excavator and Articulated Dump Trucks and D6 Dozer.
   - Approx. 40 hours (5 days) for Mucking.

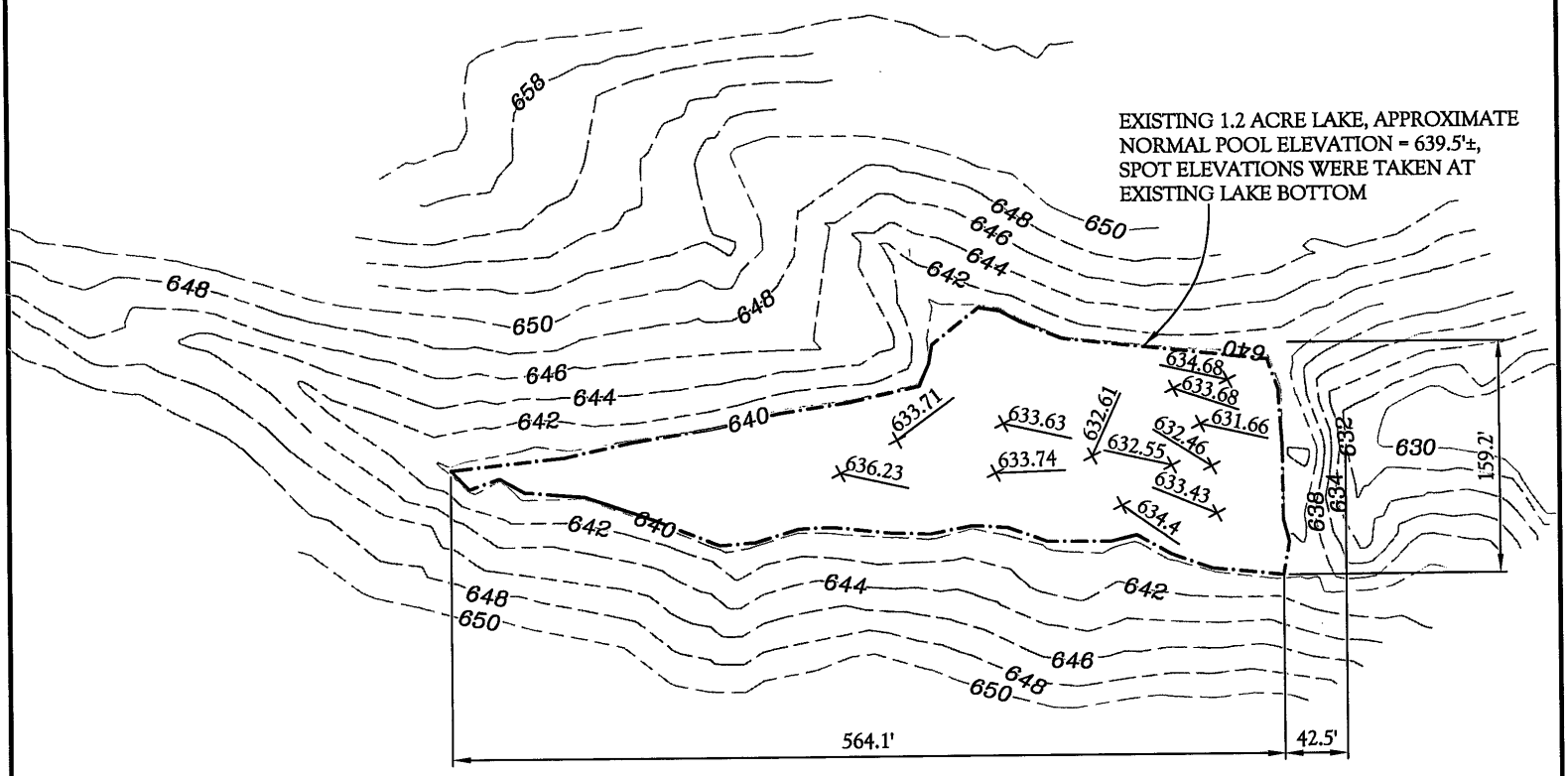
5. The new earthen keyway installed and compacted.
   - Action to be performed using Excavator, Articulated Dump Trucks, D6 Dozer and 60" Vibratory Sheep's Foot Roller installed in 8" loose lifts and compacted..
   - Approx. 8 hours (1 day) to install Keyway.
6. The pond area will be excavated and graded to match proposed design elevations.
   - Action to be performed using Excavator, Articulated Dump Trucks, D6 Dozers, 84" Vibratory Roller and 60" Vibratory Smooth Drum Roller.
   - Approx. 40 Hours (5 days) for Excavation and Grading.
7. The new dam will be constructed of compacted clay core to the emergency spillway elevation as directed per plan.
   - Action to be performed using Excavator, Articulated Dump Trucks, D6 Dozer and 84" Vibratory Sheep's Foot Roller.
   - Approx. 40 hours (5 days) for Dam Installation and in conjunction with item # 6 – Excavating and Grading Pond to Design Elevation.
8. The weir structure and 48"overflow piping will be installed.
   - Action to be performed using and Excavator, Track Loader, and Rubber Tired Backhoe.
   - Approx. 16 hours (2 days) for Pipe and Structure Installation.
9. The Geo-membrane Liner will be installed.
   - Action to be performed using Excavator, Utility ATV and Human Manpower.
   - Approx. 40 hours (5 days) for Geo-membrane Liner Installation.
10. The Emergency Rip Rap Spillway will be installed along with the Rip Rap Channel for the Pump House Discharge.
    - Action to be performed using Excavator, Track Loader, Rubber Tired Backhoe
    - Approx. 16 hours (2 days) to install Rip Rap.
11. The banks and dam of the pond will be stabilized by seed, straw and protection methods as directed through the plans and specification.
    - Action to be performed using Grading Tractor, Skid Steer, Straw Blower and Human Manpower.
    - Approx. 16 hours (2 days) to install Seed, Straw and Protection.

If you have any questions or comments please call.

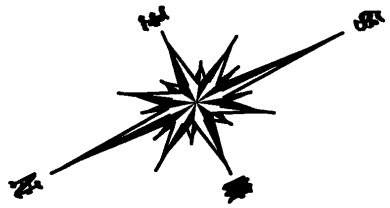
Sincerely,

John C. Devine

CC: BCD, Inc., File



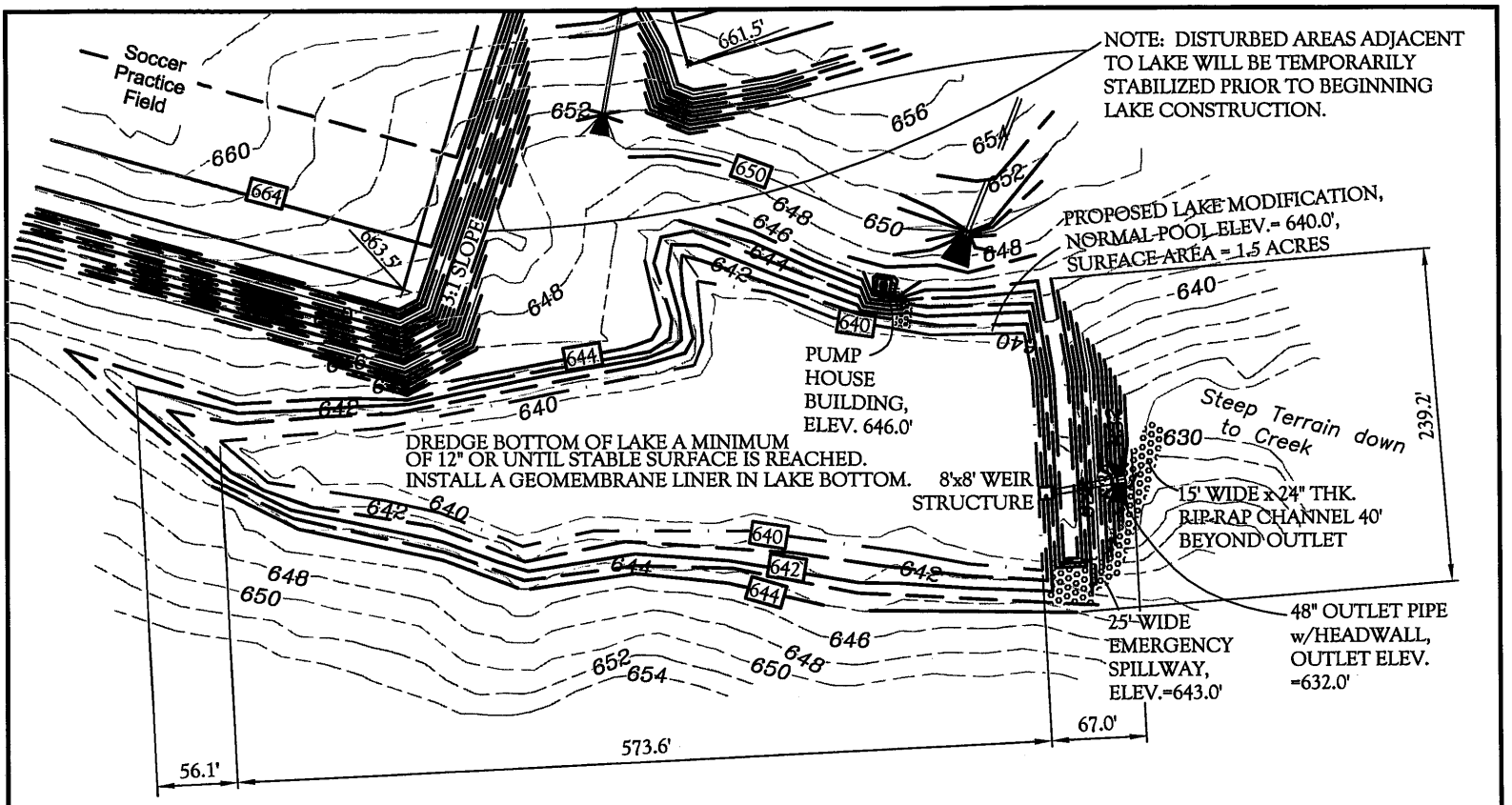
EXISTING LAKE



Thomas Nelson High School; Bardstown, Kentucky

Date: 09/22/09	Drawn By: RPM	Scale: 1"=100'

Horizon ENGINEERING, LLC
111 North Second Street
P.O. Box 364
Bardstown, Ky. 40004
Phone: (502) 348-4330 - Fax: (502) 348-4340



PROPOSED LAKE

Thomas Nelson High School; Bardstown, Kentucky

Date: 09/22/09	Drawn By: RPM	Scale: 1"=100'

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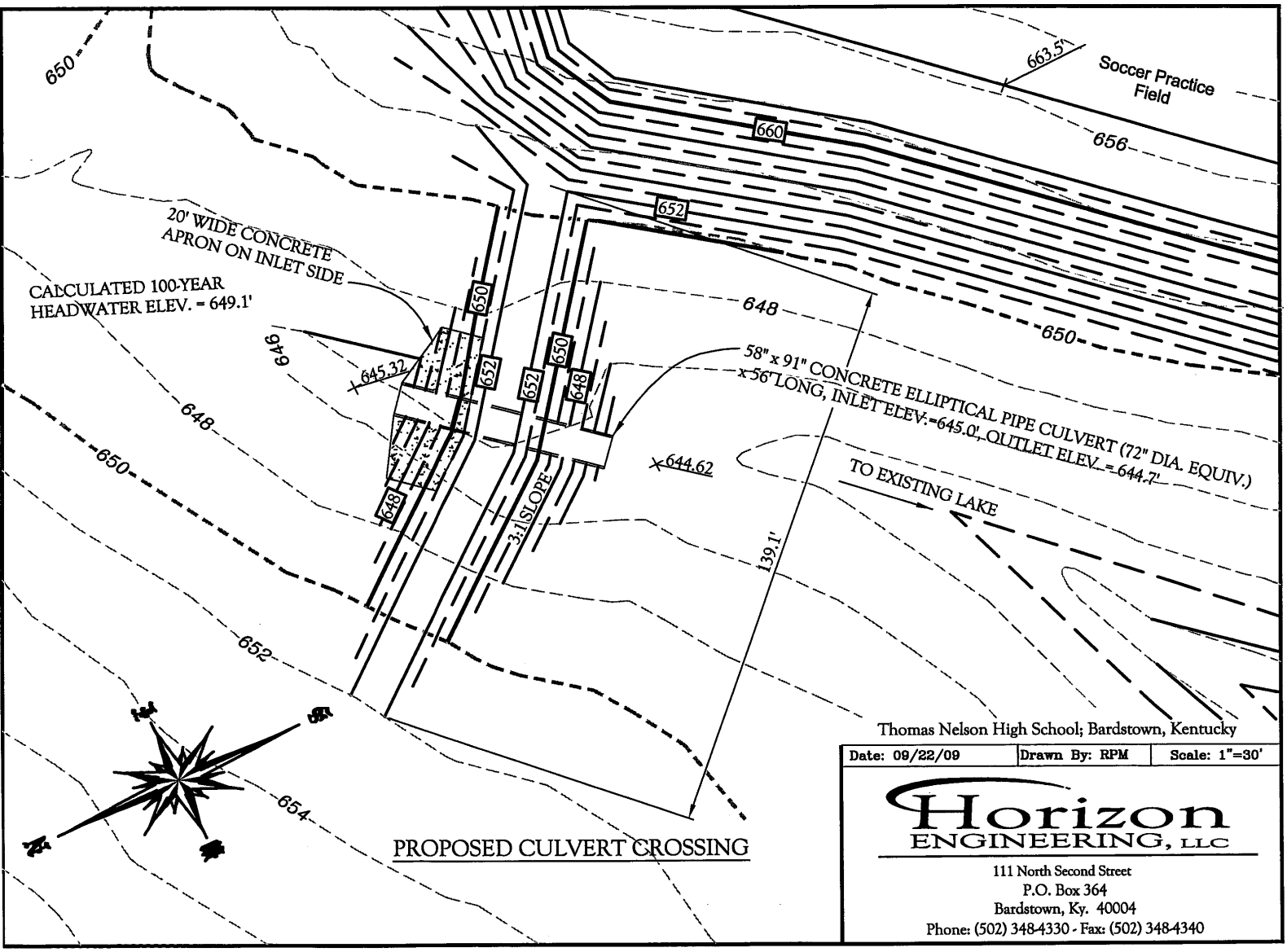

Thomas Nelson High School; Bardstown, Kentucky

Date: 09/22/09	Drawn By: RPM	Scale: 1"=30'

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P.O. Box 364
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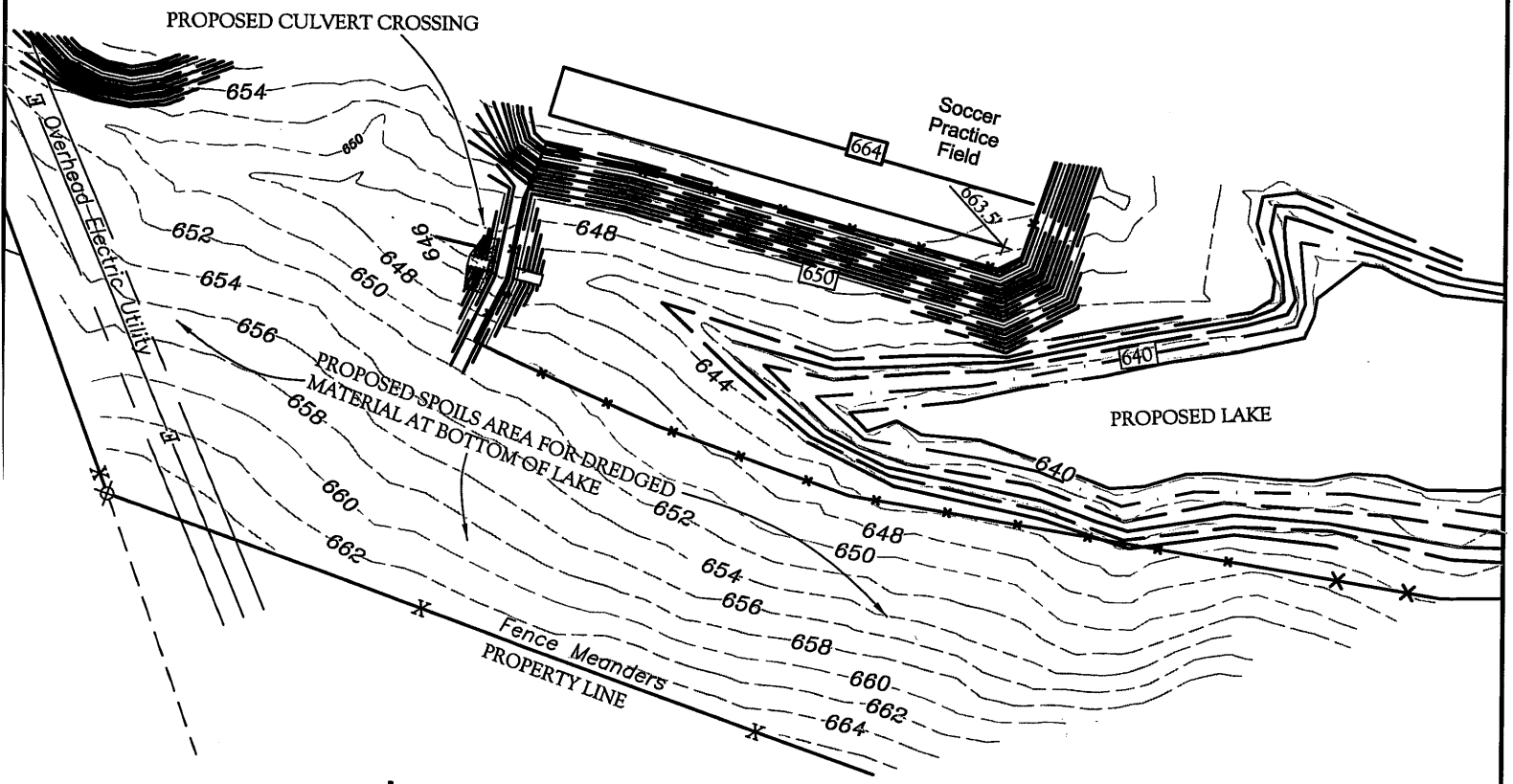

PROPOSED DISPOSAL AREA

Thomas Nelson High School; Bardstown, Kentucky

Date: 09/22/09	Drawn By: RPM	Scale: 1"=100'

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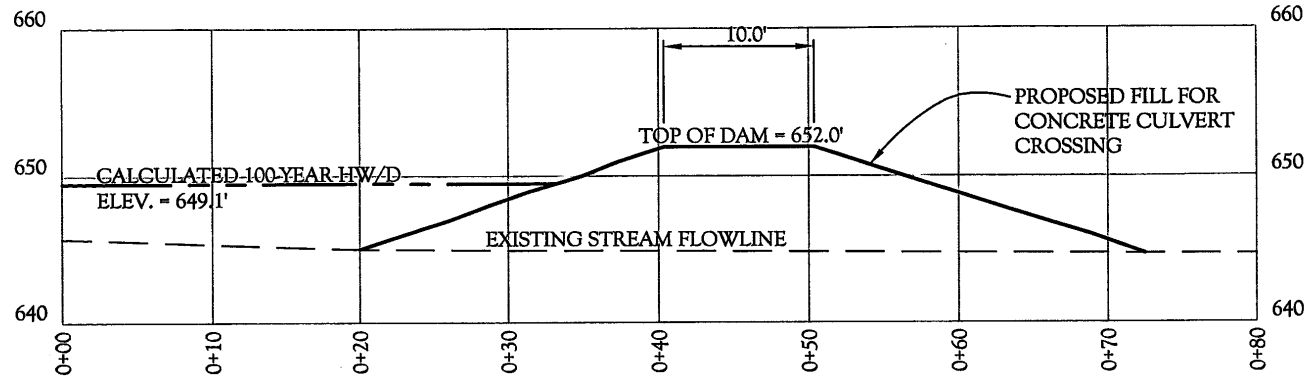
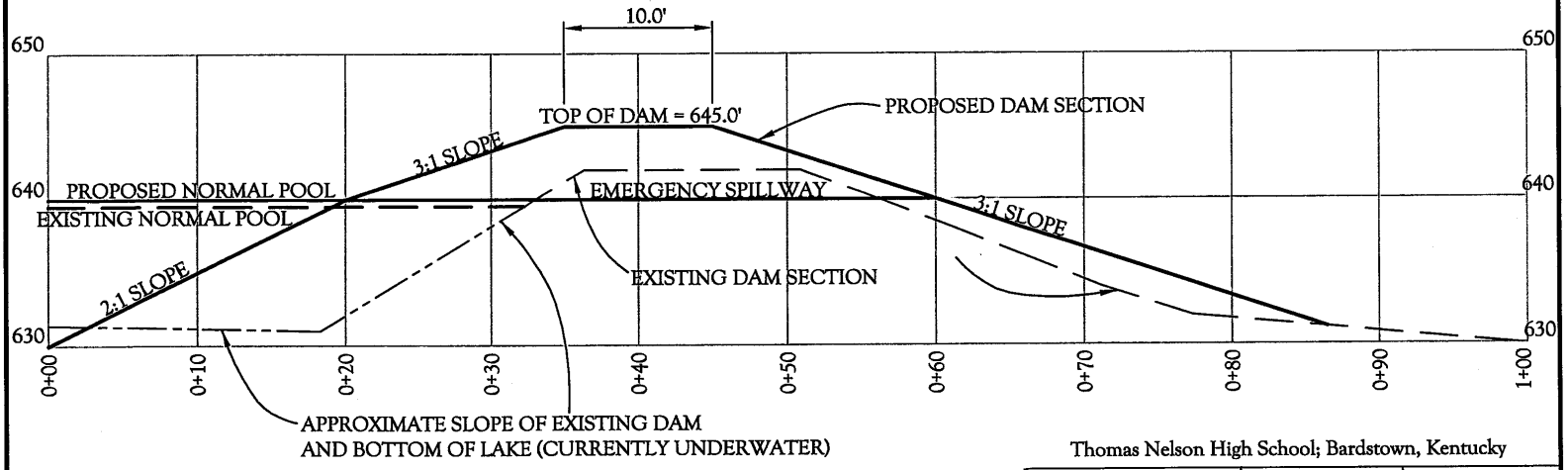


PROPOSED CONCRETE CULVERT CROSSING - FILL WIDTH = 60'



APPROXIMATE SLOPE OF EXISTING DAM
AND BOTTOM OF LAKE (CURRENTLY UNDERWATER)

EXISTING DAM WIDTH = 60'
PROPOSED DAM WIDTH = 85'

Thomas Nelson High School; Bardstown, Kentucky

Date: 09/22/09	Drawn By: RPM	Scale: 1"=10'

Horizon
ENGINEERING, LLC
111 North Second Street
P.O. Box 364
Bardstown, Ky. 40004
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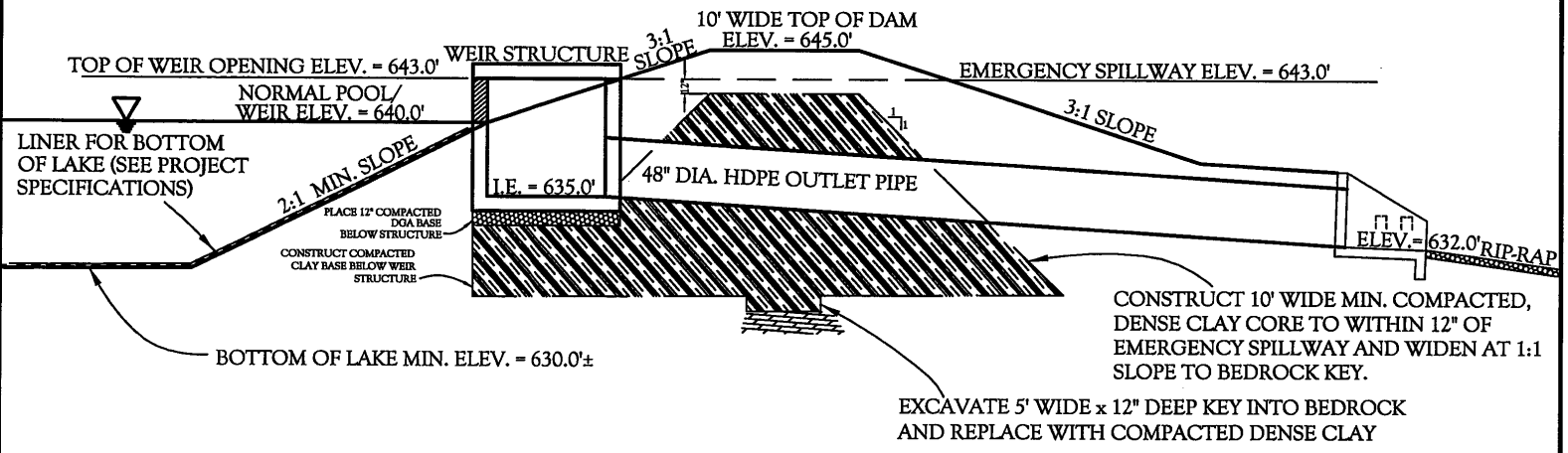

DAM SECTION

Thomas Nelson High School; Bardstown, Kentucky

Date: 09/22/09	Drawn By: RPM	Scale: 1"=30'

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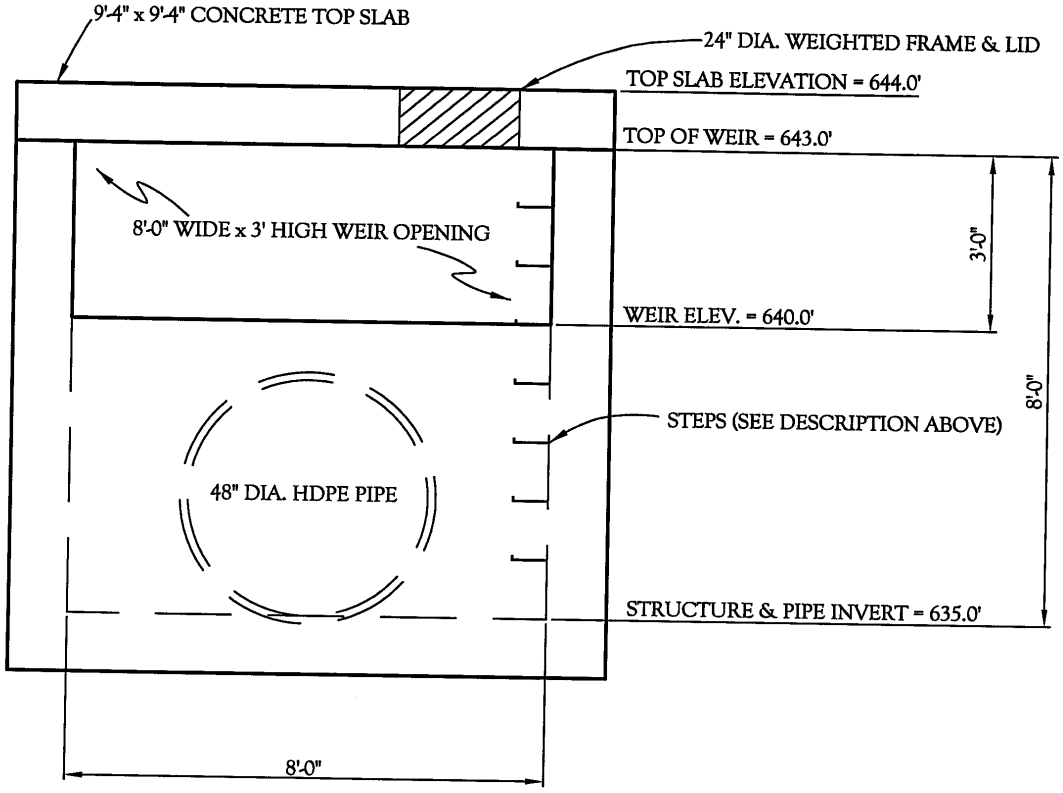

WEIR STRUCTURE ELEVATION

WEIR STRUCTURE NOTES:

WEIR STRUCTURE MAY BE PRECAST OR CAST-IN-PLACE CONCRETE CONSTRUCTION. MINIMUM 28-DAY CONCRETE STRENGTH SHALL BE 4000 PSI. ALL WALLS SHALL BE A MINIMUM OF 8" THICK. TOP SLAB SHALL BE A MINIMUM OF 12" THICK AND BASE SLAB SHALL BE 8" THICK. MINIMUM STEEL REINFORCEMENT SHALL BE #4 BARS @ 6" O.C. EACH WAY. REINFORCEMENT SHALL EXTEND INTO THE TOP & BOTTOM SLABS FROM THE WALLS.

Thomas Nelson High School; Bardstown, Kentucky

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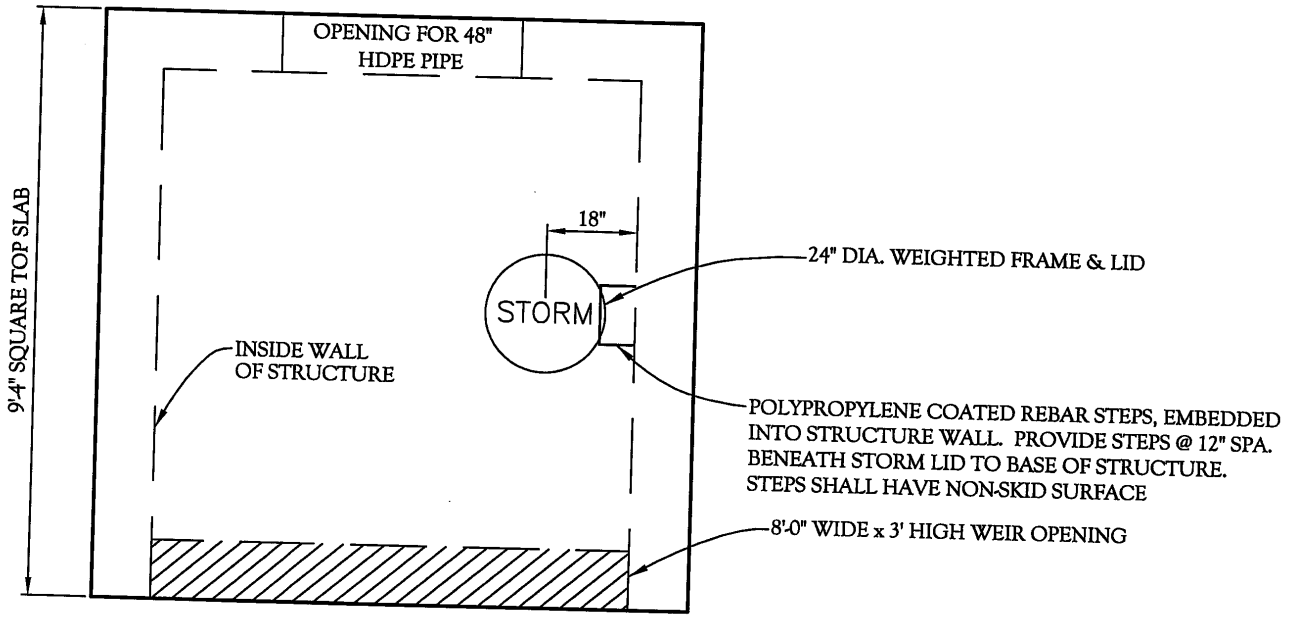

WEIR STRUCTURE TOP SLAB PLAN

Thomas Nelson High School; Bardstown, Kentucky

Date: 09/22/09	Drawn By: RPM	Scale: 1"=30'

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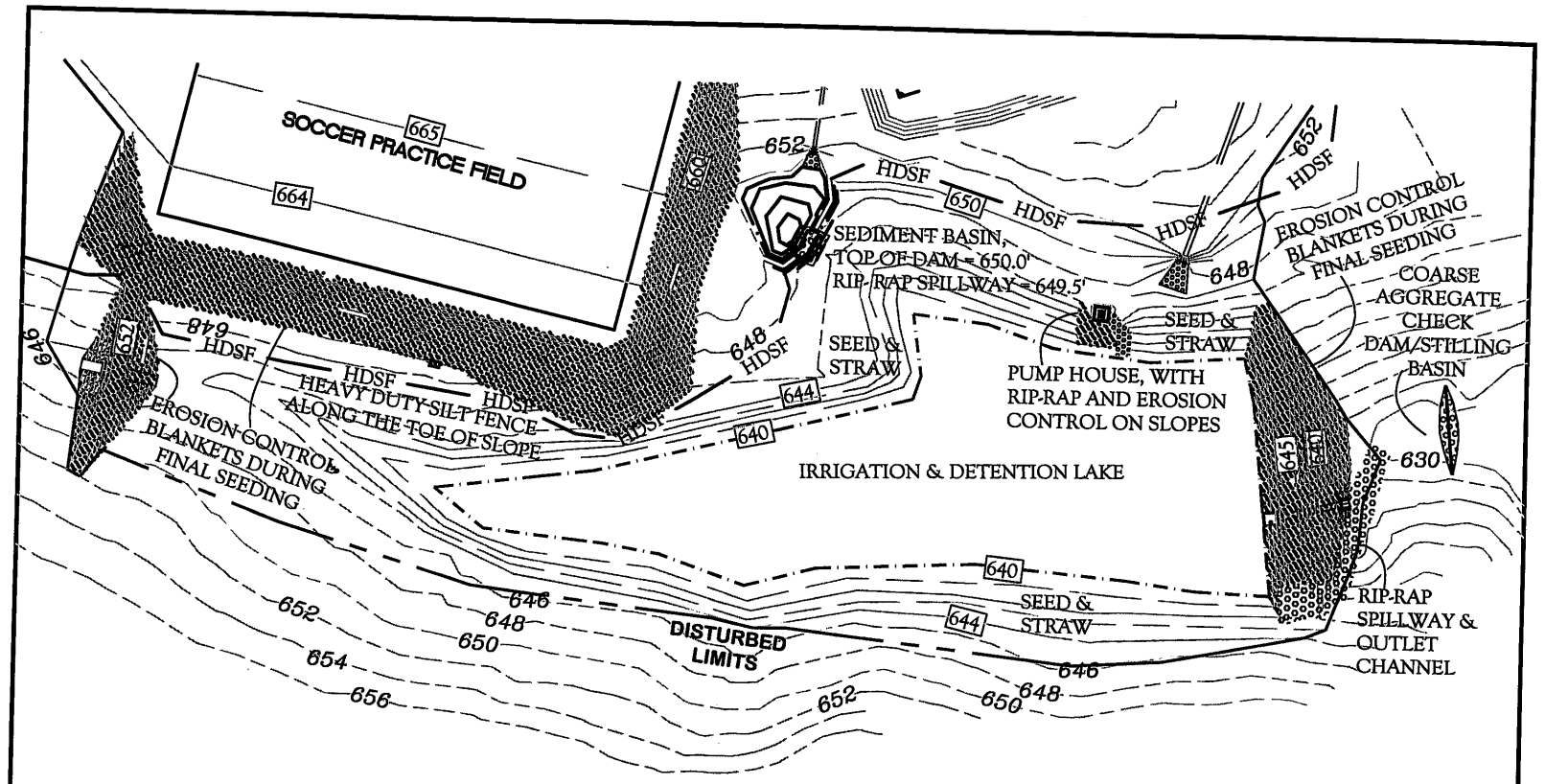

RIP-RAP FOR PADS, SPILLWAY & SILT CHECKS

EROSION CONTROL BLANKETS

HDSF — HEAVY DUTY SILT FENCE

DISTURBED LIMITS

Thomas Nelson High School; Bardstown, Kentucky

Date: 09/22/09	Drawn By: RPM	Scale: 1"=100'

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111 North Second Street
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SECTION 31 22 19.13 – FINISH GRADING

PART 1 – GENERAL

1.01 RELATED WORK

(A) Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

(B) Related Sections:
Stormwater Pollution Prevention Plan (SWPPP)
Section 31 23 00 – Excavation and Backfill
Section 32 18 23.13 Natural Baseball Surfacing
Section 32 18 23.23 Natural Field Sport Surfacing
Section 32 92 00 – Seeding and Sodding

1.02 SUMMARY

(A) Section includes site cleanup, subgrade preparation and final grading to provide smooth, positive draining finished grades free of depressions, high spots, loose material and compacted areas. Any items that are normally required to achieve this finish, but are not specifically called for in the Plans and Specifications are to be considered a part of the project.

1.03 SUBMITTALS

(A) Submittal procedures: Under provisions of Construction Managers Division 01 Sections.

1.04 CLOSEOUT SUBMITTALS

(A) Closeout procedures: Under provisions of Construction Managers Division 01 Sections.

1.05 COORDINATION

(A) Coordination and project conditions: Under provisions of Construction Managers Division 01 Sections.

PART 2 – PRODUCTS

2.01 MATERIALS

(A) Topsoil: Clean, fertile topsoil, without admixture of subsoil material and free from gravel, clay lumps, stones over 1" diameter, roots, sticks or other foreign materials.

PART 3 – EXECUTION

3.01 EXAMINATION

(A) Coordination and project conditions: Under provisions of Construction Managers Division 01 Sections.

(B) Inspect areas and conditions to which finished grading shall be performed and ensure any unsatisfactory conditions have been corrected prior to proceeding with work.

(C) Finish grades shown on the Site Grading Plans shall be followed, unless discrepancies or inconsistencies are brought to the attention of the Owner prior to or during commencement of work and approval is given to deviate from the plans. Excess material shall be placed on-site in designated spoils areas. Spoils area shall be finished with a 5% slope at top of pad toward the west property line and tied back into existing grades with 3:1 slopes. Contractor shall ensure these areas are finished graded and stabilized, as noted in the SWPPP.

3.02 PREPARATION

(A) The Contractor shall use precaution to prevent damage to existing permanent structures, utilities, plants, trees, pavement and other project components on the site during finished grading procedures. Provide barriers or fences as necessary to protect existing conditions. Use appropriate equipment that will prevent damage to adjacent materials or structures.

(B) All topsoil on the site shall be saved and used on the project area, unless other arrangements are made with the owner. Premium topsoil shall be separated for use on the athletic field areas.

(C) Do not commence finish grading work when subgrades are saturated with water or are frozen.

(D) Do not commence finished grading work until exterior building work is completed and worker traffic over lawn areas has ceased. All site lighting and utility work shall also be completed.

(E) All construction debris, large stones and other foreign material shall be removed from the site prior to grading operations as discussed in the SWPPP.

3.03 GRADING OPERATIONS

(A) Scarify the lawn and field surfaces to a minimum depth of 6" prior to final grading.

(B) After rough grading has had sufficient time to settle, place topsoil to a 4" minimum depth on all disturbed areas designated for grass for lawns. See Natural Baseball Surfacing and Natural Field Sport Surfacing for specific instructions for athletic surfaces.

(C) Slope finish grades to drain surface water away from buildings, walks, paving and other structures unless noted otherwise. Slope finish grades to drain surface water to drainage structures and drain ways as shown on the Grading Plans C2.1 thru C2.5 and Storm Piping Plans C2.6 and C2.7 of the construction plans.

(D) Add water as necessary to melt clods and induce settlement of the topsoil mixture. When adequately dry, regrade, adding topsoil, if necessary.

(E) Fill and compact any depressions and remove all loose material to finish surface, creating a uniform, compacted surface.

(F) Rake surface until the surface is smooth, friable and has a uniform, fine texture with no lumps or stone over 1" diameter.

3.04 TOLERANCES

(A) Adjacent to building and other structures, finish grade to within ½" required grades and lines per the Project Plans. Elsewhere, finish grade to within 1" of proposed grades. Slopes shall be graded to be smooth and uniform.

(B) Make proper allowances for settlement. Minimum soil depths specified are after settlement.

3.05 SITE CLEANUP

(A) The contractor shall remove all equipment, unused materials and other items or debris from the site once work is complete. The construction site shall be left in a neat, orderly condition, clear of all unsightly items.

3.06 WARRANTY

(A) Settlement in fill or backfill, which may occur within warranty period, shall be corrected at no cost to the Owner.

END OF SECTION 31 22 19.13

SECTION 31 25 00 – EROSION PREVENTION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 RELATED WORK

(A) Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

(B) Related Sections:
Stormwater Pollution Prevention Plan (SWPPP)
Section 31 10 00 – Site Clearing
Section 32 92 00 – Seeding & Sodding

1.02 SUMMARY

(A) Erosion prevention and sediment control:

1. Temporary Soil Stabilization: This Work shall consist of seed bed preparation, furnishing and placing seed, mulch, and caring for such areas until acceptance. Temporary soil stabilization shall be used in the following circumstances and in accordance with the Stormwater Pollution Prevention Plan (SWPPP):

   (a) In non-paved areas, rough grading and permanent soil stabilization or temporary soil stabilization shall be maintained. In no case shall the time between completion of construction activities and the completion of permanent or temporary stabilization exceed 14 calendar days.

   (b) Where construction operations are temporarily suspended for 14 days or longer permanent soil stabilization is not practical.

   (c) When an immediate cover would be desirable to minimize erosion, siltation, or pollution of any area.

2. Sediment Control: This work shall consist of the temporary sediment control measure to be performed during the life of the Project to control water pollution caused by erosion of exposed soil. Sediment control facilities shall be properly installed and maintained per details, and the drawings. Controls found to be inadequate must be altered to maintain sediment control. All erosion and sediment control measures shall be performed in the sequence, locations and per the instructions of the Stormwater Pollution Prevention Plan (SWPPP).

PART 2 - PRODUCTS

2.01 Materials

(A) Topsoil: Topsoil shall meet the requirements set forth in Lawns Specification.

(B) Temporary Seed: Seed used for temporary seeding may be accepted on the basis of purity and germination values shown on the seed bag. The Work of temporary seeding of erosive earth areas shall be done promptly at the locations and times directed under SWPPP. Rye grain, annual rye or winter

wheat seed shall be used for temporary seeding and as specified in the SWPPP.

(C) Straw Mulch

(D) Silt Fence

(F) Rip Rap: As specified on the Plans and in accordance with the SWPPP.

PART 3 – EXECUTION

3.01 EROSION PREVENTION

(A) Temporary Soil Stabilization.

1. Preparing the Seed Bed: Areas to be temporarily seeded shall require the preparation of a seed bed only when the soil surface is dry, non-uniform or contains clods or large stones. Disturbance of the soil surface by whatever means that is practical to create a 2 inch thick loose and roughened condition capable of retaining the seed and mulch will be required when the soil surface is dry or non-uniform. Clods and stones larger than 2 inches shall be removed. The preparation of a seedbed will not be required when the soil surface is in an acceptable condition from the normal grading operations.

2. Seeding: Temporary seeding shall be permitted only during the periods indicated in the table below. In order to stabilize erodible areas with vegetation through the winter, temporary seeding must be completed no later than October 31. Working the soil to cover the seed will not be required. Temporary seeding shall be sown at the appropriate rate of 3lbs. per 1,000 square feet.

Work Item	Accepted Work Interval
Temporary Seeding with Annual Rye	March 1 - Nov. 1
Temporary seeding with Winter Wheat or Rye Grain	September 1 - Nov. 1

3. Protection: All seeded areas shall be promptly protected with straw mulch or wood cellulose fiber mulch. The materials shall be uniformly applied and anchored to the seeded areas.

4. Dormant Season Stabilization: Areas requiring temporary stabilization during the period of November through February, when seeding is not permitted, shall receive only an application of straw mulch and shall be 3 tons per acre.

3.02 SEDIMENT CONTROL

(A) General: The Contractor shall exercise every reasonable precaution at all times to prevent water pollution by the deposition of sediment in streams, lakes, and reservoirs. All requirements and procedures in the Stormwater Pollution Prevention Plan (SWPPP) and these project specifications shall be followed. The Contractor shall conduct and schedule operations in a manner as to avoid or minimize the muddying or siltation of areas adjacent to the construction site including streets, storm sewers, etc. Specific instructions on how to prevent and minimize pollution of storm water runoff from the site are in the SWPPP. The Contractor shall comply with the applicable provisions of

KRS Chapters 220 and 224 of the State Water Pollution Control Laws and other applicable statutes relating to the prevention or abatement of water pollution.

(B) Silt Fence: Silt fence shall be installed, inspected, maintained and removed in accordance with the SWPPP and the following requirements:

1. Installation: Silt fence shall be installed at the toe of the downhill slope at all property lines and around any lakes, streams, creeks or reservoirs that require protection. Silt Fence shall be installed and at the locations shown on the plans, prior to the start of construction in areas that drain to the fence location. Silt fence shall be embedded a minimum of 6" into the ground and shall be located at least 10 feet from the toe of steep slopes. Silt fence shall be heavy-duty and installed, per the details on the project plans and SWPPP.

2. Inspection and Maintenance: Silt Fence shall be inspected weekly or after each rainfall greater than ½ inch, whichever is more frequent, and maintained as needed throughout construction. Built-up sediment shall be removed from silt fence when it has reached one-third of the height of the fence.

3. Removal: Silt Fences temporarily removed to facilitate construction activities shall be replaced immediately following completion of such activity.

(C) Inlet and Ditch Protection: Rip-rap silt checks shall be constructed at existing culvert and storm inlets, existing ditch lines, and in existing drain ways in locations indicated on the Project Plans, prior to the start of construction activities.

1. Installation: Rip-rap silt check dams shall be constructed a maximum of 3' in height, 5' wide at the top and 2:1 side slopes. Center of dam should be 6" lower than the sides. First, a geotextile fabric shall be placed on top of the soil. Then stone should be hand placed along the bottom and up the banks of the channel. Ensure that the center of the silt check is 6" lower than the edges and extend the ends of the silt check to the top of the bank to prevent bypassing and side cutting around the silt check dam.

2. Inspection and Maintenance: Silt checks shall be inspected weekly or after each rainfall exceeding ½ inch. Repair any failed silt checks and clean out sediment from upstream side of silt checks to ensure they are in operation for the full length of the project.

3. Removal: Inlet protection temporarily removed to facilitate construction activities shall be replaced immediately following completion of such activity. The silt checks may be permanently removed after final seed and straw.

(D) Temporary Sediment Basin: The temporary sediment basin shall be constructed prior to any earth moving activities as instructed per the Project Plans, the Stormwater Pollution Prevention Plan (SWPPP), and the requirements below:

1. Installation: The sediment basin shall be constructed by building a 3' wide earthen dam with 3:1 side slope and a rip-rap spillway. It shall be constructed to the dimensions and elevations called for on the Project Plans. The silt fence shall tie into each side of the dam as shown on the plans.

2. Inspection and Maintenance: The sediment basin shall be inspected weekly or after each rainfall exceeding ½ inch. Remove excess sediment once it has reached one-third of the height of the dam. A log of all inspections and repairs shall be kept in the SWPPP log sheets and kept on site at all times.

3. Removal: Once soil disturbing activities have been completed upstream, the sediment basin may be removed and the area shall be taken to finish grade, seed & straw.

(E) Rip-Rap Outlet Protection: A rip-rap pad shall be constructed at the outlet of the primary spillway of the lake and all outlet headwalls. This includes a rip-rap channel at the emergency spillway of the lake along the toe of slope down to the natural drain. All pads shall be constructed, maintained, and inspected per the Project plans, details, and the SWPPP.

(F) Construction Entrance: The first 150 l.f. of the existing gravel drive shall be maintained and utilized for the construction entrance/exit on this project.

3.03 INSPECTION REPORTS

(A) Inspection of all storm water control devices shall be documented, including any repairs or maintenance that are required. Log sheets are included as part of the Stormwater Pollution Prevention Plan. Logs of all inspections shall be kept with the SWPPP on the job-site and made available for review anytime during the project duration.

END OF SECTION 31 25 00

SECTION 32 92 00 – SEEDING & SODDING

PART 1 – GENERAL

1.01 RELATED WORK

(A) Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

(B) Related Sections:
Stormwater Pollution Prevention Plan (SWPPP)
Section 31 22 19.13 – Finish Grading
Section 32 92 00 – Erosion Prevention and Sediment Control
Section 32 18 23.13 - Natural Baseball Surfacing
Section 32 18 23.23 – Natural Field Sport Surfacing
Section 32 80 00 - Irrigation

1.02 SUMMARY

(A) Section includes specifications for final seeding and sodding of the project site.

1.03 SUBMITTALS

(A) Submittal procedures: Under provisions of Construction Managers Division 01 Sections.

(B) Seed vendor's certification including percentage by weight, percentages of purity, germination and weed seed content for each type of grass species.

(C) Fertilizer analysis.

1.04 CLOSEOUT SUBMITTALS

(A) Closeout procedures: Under provisions of Construction Managers Division 01 Sections.

1.05 COORDINATION

(A) Coordination and project conditions: Under provisions of Construction Managers Division 01 Sections.

PART 2 – PRODUCTS

2.01 MATERIALS

(A) Lawn Seed Mixture: 40% Annual Rye, 40% Kentucky 31 Fescue, 20% Baron Kentucky Bluegrass.

(B) Sod: Comply with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color and texture, strongly rooted and capable of vigorous growth and development when planted. Sod should be Kentucky Bluegrass (Poa pratensis) a minimum of three cultivars.

(C) Crown Vetch: In areas shown on the Project Plans

(D) Athletic Field Seed Mixture: Tall Fescue turf–type variety specifically designed for athletic turfs, as manufactured by Double Eagle, Scott Seed, The Rebels brand, Gold Tag or equivalent.
(E) Football and Soccer Turf: Bermuda Grass, Riviera variety.
(F) Fertilizer: Granular, commercial-grade complete fertilizer of neutral character, consisting of fast and slow-release nitrogen, 50% derived from natural organic sources of urea-form, phosphorous and potassium in amounts recommended in soils report from a qualified soil-testing agency.
(G) Sulfur: Granulated agricultural sulfur.
(H) Straw Mulch: Clean oat or wheat straw, well seasoned before bailing, free from mature seed bearing stalks or roots of prohibited weeds.
(I) Tackifier: Liquid concentrate diluted with water forming a transparent 3-dimensional crust, permeable to water and air and not containing any agents toxic to seed germination.
(J) Water: Clean, fresh and free from harmful materials. Water shall be furnished by the Owner. All hoses and other irrigation equipment required for the work shall be furnished by the Contractor.
(K) Erosion Control Blanket: Temporary, lightweight, photodegradable flexible matting structure used during seeding to provide short-term soil stabilization. Mats shall be composed of a lightweight, single polypropylene net weaved with straw fiber and rated for a maximum permissible velocity of 5 ft./sec. Mats should provide protection for up to 12 months once installed. Products shall be as manufactured by Synthetic Industries, North American Green or equal.
(L) Turf Reinforcement Mat: Turf reinforcement mats (TRMs) shall be constructed of a permanent, high-strength, three-dimensional matting structure that incorporates a straw/coconut fiber matrix. The top polypropylene layer shall have a minimum weight of 5 lbs/ 1000 sq. feet. The second layer shall be a polypropylene, corrugated 24 lbs/ 1000 sq. feet approximate weight. The third layer shall consist of matrix material of 70% agricultural straw and 30% coconut fiber. The bottom net shall be polypropylene 5 lbs/ 1000 sq. feet. Turf reinforcement mats shall provide extended-term, pre-vegetated erosion protection and permanent turf reinforcement in a wide range of applications, including severe slopes, and medium to high-flow channels. Turf reinforcement mats shall be manufactured by North American Green or approved equal.

PART 3 – EXECUTION

3.01 EXAMINATION

(A) Coordination and project conditions: Under provisions of Construction Managers Division 01 Sections.
(B) Inspect conditions of areas to be seeded and sodded and ensure any unsatisfactory conditions have been corrected prior to proceeding with work.

3.02 PREPARATION

(A) Soil preparation areas shall be limited to areas that will be immediately seeded. Remove sticks, roots and stones over 1" diameter and other foreign material from the surface area. Ensure that finished grading has been completed such that a smooth, positively draining, uniform surface has been prepared. Immediately before any seed is sown, the ground shall be

prepared using a harley rake, chain harrow drag or equal. The ground shall be raked until the surface is smooth, friable and of a uniform fine texture. Surfaces shall be graded to such elevation that the lawn, when established, shall be flush with any adjacent turfed, paved or curbed area. Any eroded areas shall be repaired and graded properly prior to final seeding operations. Refer to Section 32 18 23.23 Natural Field Sport Surfacing and 32 18 23.13 Natural Baseball Surfacing for more specific instructions on soil base and preparation for athletic fields

(B) Apply fertilizer to all disturbed areas to be seeded or sodded at a rate equal to 1.0 lb. per 1000 sq. ft. for lawn areas. Apply fertilizer to Bermuda grass and athletic fields as recommended by soil analysis and supplier. Apply fertilizers by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with soil to a depth of 3" by disc or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.

3.03 SEEDING & SODDING OPERATIONS

(A) Permanent seeding shall be permitted only during the time intervals of March 15th to May 15th and September 1st to October 15th. Permanent seeding of all athletic practice fields, baseball field, softball field and band field shall occur in the Fall of 2010, specifically between September 1st and October 15th. Permanent seeding of Bermuda grass for the football and soccer turf shall occur in the Spring of 2011, in a period recommended by the seed supplier. Other periods shall only be allowed if approved by the Engineer and Owner. Permanent seeding shall be performed in areas indicated on the Project drawings and as instructed in the Stormwater Pollution Prevention Plan. Perform seeding operation when the soil is not saturated and when winds do not exceed 5 miles per hour velocity. Incorporate seed into the top surface of the soil by raking lightly or rolling with a light lawn roller, Cultipacker. Immediately after seeding, cover areas with a straw mulch layer evenly spread at a rate of 1 bale per 1000 sq. ft. to achieve coverage of approximately 50% of the soil surface area. Anchor straw with liquid tackifier applied uniformly at rates recommended by the manufacturer. Protect buildings, pavement, plants, trees and all non-seeded areas from tackifier overspray and seeding operations.

(1) Lawn Seed Mixture: Areas shall be seeded evenly with a mechanical spreader at rate of 5 lb per 1000 square feet.

(2) Crown Vetch: Sow crown vetch seed at a uniformly at a rate that will provide 9 live seedlings per square yard and at a rate of no less than 30 pounds per acre.

(3) Athletic Field Seed Mixture: The baseball, and softball fields as well as the practice fields for football and soccer and the band field shall be seeded with this mixture by means of a mechanical spreader at a rate of 8 lb per 1000 square feet. Seeding shall be done in the Fall of 2010 and traffic shall not be allowed on the field for one year, except to perform maintenance. Refer to Section 32 18 23.23, Natural Field Sport Surfacing and Section 32 18 23.13, Natural Baseball Surfacing for more specific instructions on soil base and preparation.

(4) Turf: Provide turf on football and soccer fields. Turf shall be Bermuda grass, Riveria variety. Seed at a rate of 1 lb/1000 sf with a drill seeder. Seeding shall be done in Spring 2011 and traffic should not be

allowed on the turf for one year, except to perform field maintenance. Refer to Section 32 18 23.23 Natural Field Sport Surfacing for more specific instructions on soil base and preparation.

(B) In areas shown on the Stormwater Erosion Control Plan, erosion control blankets shall be installed over the seeded area. Erosion control blankets shall be installed per the manufacturer's instructions and as instructed on the Erosion Control Details of the Project drawings and in accordance of the SWPPP. All blankets shall be anchored with wire U-shaped staples, in accordance with the anchor pattern on the Erosion Control Detail sheet. Ends of blankets shall be anchored in a trench 12" deep and 6" wide across the entire width. Longitudinal anchor slots shall be 4" wide and 4" deep along both sides of the mat/blanket to bury the edges. Overlap end of rolls and adjacent rolls as specified on the in the project details based on time of soil, and slope blankets are being used on. Disturbed areas from the anchor trenches will need to be reseeded. Blankets shall be laid in a horizontal pattern on slopes less than 8' in height and in a vertical pattern for slopes 8' and higher. Mulch shall not be applied in the areas of the erosion control blankets.

(C) Sodding shall be permitted only during the time intervals of March 15th to May 15th and September 1st to October 15th. Other periods shall only be allowed if approved by the Engineer and Owner. Sod shall be placed in the areas shown on the Stormwater Erosion Control Plan and as specified in the SWPPP and this specification. Sod shall be laid within 24 hours of harvesting. Do not lay sod if dormant or if ground is muddy or frozen. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod without stretching or overlapping sod. Stagger sod strips or pads to offset joints in adjacent courses. Ensure that sod is laid such that the elevation of the sodded area shall be flush with any adjacent turfed, paved or curbed area and provide positive drainage. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod, removing excess to avoid smothering sod and adjacent grass. Saturate sod with fine water spray within two hours of planting. During first week after installation, water daily or more frequently as necessary to maintain moist soil conditions to a minimum depth of 1½" below sod.

(D) Following permanent seeding of all areas, entire disturbed areas that have been seeded will be watered by use of lawn sprinklers or installed irrigation equipment. Initial watering shall continue until the equivalent of a 2" depth of water has been applied over the seeded areas, at a rate, which will not dislodge seed. Watering methods and equipment shall not cause erosion or compaction to the surface. Water seeded areas regularly until final acceptance and at such frequency as weather conditions require, to maintain appropriate soil moisture for seed germination and lawn establishment. Refer to Section 32 80 00 Irrigation of these specifications for athletic field watering.

3.04 MAINTENANCE

(A) Begin maintenance of all seeded lawn areas immediately after each area is planted and continue until acceptable cover is established for a minimum of 60 days after date of occupancy, except when full maintenance period has not

elapsed before end of fall planting season, or if lawn is not fully established at that time, then maintenance period shall continue into spring planting season.

(B) All athletic, turf, practice and band fields shall be maintained, watered and mowed by the Contractor for a period of one year from seeding. Fields will be inspected after one year to determine if fields can be accepted or if additional measures are necessary.

(B) Maintenance to include watering, spot weeding, mowing, application of herbicides, fungicides, insecticides, fertilizers and re-seeding until a full, uniform stand of grass free of weeds, undesirable grass species, disease and insects.

(C) Mow grassed areas as soon as grass growth reaches a 3½" height. Cut back to 2½" in height. Remove no more than 40% of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Repeat mowing as required to maintain specified height.

(D) Apply fertilization to grass after first mowing and when grass is dry. Apply fertilizer at rates that will provide 1 lb per 1000 square feet of grass area or at rate determined by soil testing.

3.05 SITE CLEANUP

(A) The contractor shall remove all equipment, unused materials and other items or debris from the site once work is complete. The construction site shall be left in a neat, orderly condition, clear of all unsightly items.

3.06 FINAL ACCEPTANCE

(A) Upon establishment of a good, healthy stand of grass, (one year minimum from time of seeding for athletic, turf, practice and band fields), the contractor shall request an inspection by the Owner/Engineer to determine if all the requirements of the specifications have been met, including a lawn and field areas free of weeds, disease, undesirable grass species and insects and that no bare spots or unacceptable cover larger than 6" dimension in any direction is visible on the surface. Once the grass areas have passed inspection, the Owner will assume maintenance of all the areas.

END OF SECTION 32 92 00

SECTION 33 47 13 - Pond and Reservoir Liner

PART 1 – GENERAL

1.01 RELATED WORK

(A) Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

(B) Related Sections:
Section 31 25 00 – Erosion Prevention and Sediment Control
Section 31 23 00 – Excavation and Backfill
Section 32 80 00 - Irrigation

1.02 SUMMARY

(A) Section includes preparation, method of placement, type of liner, seaming, and testing of the lake liner system.

1.03 SUBMITTALS

(A) Submittal procedures: Under provisions of Construction Managers Division 01 Sections.

(B) Conceptual description of the proposed plan for placement of the geomembrane panels over the area of installation.

(C) Geomembrane manufacturer's affidavit providing assurance that the qualifications of the Geomembrane Manufacturer and the Geomembrane Installer have been achieved.

(D) Geomembrane Manufacturer's Quality Assurance/Quality Control (QA/QC) certifications for each shipment of geomembrane to verify that the materials supplied for the project are in accordance with the requirements of this specification. The certificates shall show the following:
1. Average thickness per ASTM D-5994
2. Carbon Black percentage per ASTM D-1603
3. Melt Flow Index per ASTM D-1238
4. Density per ASTM D-1505/D 792
5. Tensile Strength and Elongation per ASTM D-6693
6. Puncture ASTM D 4833
7. Tear Resistance per ASTM D-1004
8. Resin Characteristics per ASTM D-1248
9. Carbon Black Dispersion per ASTM D-5596

(E) Manufacture's warranty covering materials and workmanship of the geomembrane.

1.04 CLOSEOUT SUBMITTALS

(A) Closeout procedures: Under provisions of Construction Managers Division 01 Sections.

1.05 COORDINATION

(A) Coordination and project conditions: Under provisions of Construction Managers Division 01 Sections.

PART 2 – PRODUCTS

2.01 GENERAL

(A) The geomembrane liner for the detention pond/irrigation reservoir shall be High Density Polyethylene (HDPE) textured on the soil facing side with a thickness of 40 mil. The liner may be manufactured by Agru America, Inc. (1-800-373-2478), Georgetown, SC, POLY-FLEX (1-888-765-9359), Grand Prairie, Texas, or GSE Lining Technology, Inc. (1-800-435-2008) Houston Texas and installed by Amcon (1-606-679-7929), Somerset, KY, and Environmental Design and Construction (1-256-551-0372) Huntsville, AL or ENGINEER approved equal.

2.02 MATERIALS

(A) The HDPE liner shall meet the following criteria:
1. High density polyethylene (HDPE) shall be used. Minimum nominal sheet thickness shall be 40 mils, with a 5 percent tolerance allowed, with QC tests per ASTM D-751/374. Sheet shall be textured on the soil facing side only.
2. The liner shall have a minimum tensile strength at yield of 84 lbs/in, width, with QC tests per ASTM D-6693.
3. It shall have a minimum puncture resistance of 90 lbs., with QC tests per FTMS 101C, Method 2065.
4. HDPE Liner density shall be 0.94 gr/cc as a minimum, with QC tests per ASTM D-792/1505.
5. The melt flow index shall be less than or equal to 1.0 gr/10 minutes, with QC test per ASTM D-1238E.
6. percent carbon black shall be between 2.0 and 3.0 percent, with QC tests per ASTM D-1603.

(B) Manufacturer shall submit certified documentation to the OWNER to demonstrate the liner being furnished meets the requirements.

(C) The HDPE liner is designed for a maximum elongation of 10 percent in this application.

(D) The polyethylene resin (ASTM D 1248 shall be mad from virgin, uncontaminated ingredients.

2.03 PRODUCT DOCUMENTATION

(A) The manufacturer shall provide QA/QC certifications for each shipment of geomembranes/liners. Manufacturer test data for raw materials used in the geomembrane production should including those items listed in 1.2D. The certification shall be signed by a responsible party employed by the manufacturer such as the QA/QC Manager, Production Manager, or Technical Service Manager. The liner shall not be accepted or approved until all required certificates have been received.

(B) All geomembrane conformance test data shall meet or exceed requirements outlined in Section 2.2. Any materials that do not conform to these

requirements shall be retested or rejected. Geomembrane that is rejected shall be removed from the project site and replaced at no cost to the OWNER. Sampling and conformance testing of geomembrane supplied as replacement for rejected material shall be performed and paid for by the contractor.

(C) Records, including test data, shall be maintained by the Geomembrane Manufacturer for one year and shall be made available upon request.

2.04 Product Labeling

Prior to shipment, the Geomembrane Manufacturer shall affix a label to each roll identifying the following characteristics:

(A) Product identification information (manufacturer name and address, brand name, product code).

(B) Thickness of geomembrane sheet, lot number, and roll number or panel number.

(C) Roll length and width.

(D) Total roll weight.

The label shall be located so that each roll of geomembrane can be identified by examining the roll or core edges. The label shall be weather proof.

PART 3 – EXECUTION

3.01 EXAMINATION

(A) Verify site conditions.

(B) Verify lake has been adequately drained and subgrade surface is acceptable to receive geomembrane liner.

(C) Neither welding nor placement of the geomembrane liner will take place during any precipitation, in the presence of excessive moisture, blowing dust, high winds, or in areas of standing water, unless necessary precautions can be taken.

3.02 PREPARATION

(A) Identify required lines, levels, contours and datum.

(B) Clay subgrade surface shall be smooth rolled and be compacted to 90% standard proctor. The clay subgrade shall be smooth drum rolled and pass a proof roll prior to installation of liner. A geogrid as manufactured by Tensar International, or approved equal may be used to achieve required subgrade strength.

3.03 PLACEMENT

(A) Method:

1. The equipment used to deploy the geomembrane shall not create excessive rutting in the subgrade nor damage the geomembrane by handling, trafficking, excessive heat or other means.
2. Care and planning shall be taken to unroll the geomembrane close to its intended, and final position.
3. The method used to place panel should minimize wrinkles.
4. The method used to unroll the panels shall not cause scratches or crimps in the geomembrane nor damage the supporting soil.

5. No personnel working on the geomembrane will smoke, wear damaging shoes, or engage in other activities that could damage the
6. Direct contact with the membrane shall be minimized and should be protected with geotextiles, extra geomembrane or other suitable material in areas where excessive traffic may be expected.
7. A minimum thickness of one foot of soil is recommended between a light dozer and the geomembrane.
8. Adequate temporary loading and/or anchoring (e.g. sand bags, tires), not likely to damage the geomembrane, has been placed to prevent uplift by wind. Geomembrane rolls, which have been damaged, shall be rejected and/or repaired as directed in these specifications.
9. The Geomembrane Installer shall maintain a daily field record of the actual placement of each panel, noting the weather conditions, seaming, parameters, panel numbers, seams welded, samples taken, and tests runs.

(B) Spotting:

1. The geomembrane shall be placed in such a manner as to orient the seams parallel to the line of the maximum slope, i.e. along the slope, not across the slope.
2. Where seams must be oriented across the slope, the geomembrane shall be placed in such a manner that the up slope at panel forms the upper panel and overlaps the down slope at panel.
3. The liner shall be anchored utilizing an anchor trench. Refer to Sheet C2.8 Irrigation and Detention Lake Details of the construction plans for the anchor trench detail.
   a. The anchor trench will be adequately drained and backfilled by the grading contractor or as outlined in the contract documents.
   b. Since backfilling the anchor trench can effect material bridging a toe of slope, consideration should be given to backfill the liner at its most contracted state; preferably during the cool of the morning or extended period of overcast skies. Care shall be taken during backfilling to prevent damage to the liner/geomembrane.
4. Spotting of deployed geomembranes shall be done with no disturbance to the soil subgrade or geosynthetic materials upon which they are placed.
5. The two geomembrane panels to be joined must overlap approximately 4-6 inches.
6. Spotting shall be done with a minimum of dragging of the geomembrane.
7. Temporary tack wielding of all types of thermoplastic geomembranes shall be allowed at the Installer's discretion.
8. When temporary tack welds of geomembranes are utilized, the welds shall not interfere with the primary seaming method, or with the ability to perform subsequent destructive seam tests.

3.04 SEAMING AND JOINING

(A) The geomembrane shall be seamed together in a manner approved for the specific geomembrane by the Geomembrane Manufacturer.

(B) In corners and odd-shaped geometric locations, seams shall be minimized.

(C) The Geomembrane Installer shall have an identification system for all field welds. All welds shall be noted and recorded in the Geomembrane Installer's daily field record along with complete details of repairs, anchoring, and geomembrane attachments to other structures.

(D) The Geomembrane Installer shall make every effort to minimize or eliminate the potential for water accumulation beneath the liner during construction and installation. The Geomembrane Installer shall remove any water found beneath the geomembrane.

(E) The HDPE liner/geomembrane area to be welded shall be clean and free of all dirt, debris, moisture, or any other foreign material. Solvents shall not be used to clean the liner panels prior to welding. The geomembrane weld shall be done as soon as possible once cleaning and preparation is complete.

(F) The welds of the adjacent geomembrane panels shall be continuous extending the full length of the panels including the portion of the panels that will be located in the anchor trench.

(G) Seaming is not allowed during rain or snow.

(H) Ambient temperatures for seaming should be above freezing, however, it may be possible to seam below freezing if equipment temperatures are set higher and seaming rates slowed down per the manufacturer's recommendations.

(I) The Geomembrane Installer shall seam all geomembranes the day they are placed.

(J) Excessive grinding of the geomembrane panel in preparation for seaming shall not be acceptable. Excessive grinding shall be considered extensive scoring of the geomembrane panel or when noticeable grinding is observed more than 1/4-inch outside of the completed weld area.

(K) All extrusion welding machines that are used shall be purged of old extrudate prior to the start of each weld run. Any extrusion welding machines that are used shall be required to continuously monitor and control the temperatures of the extrudate and the zone of contact to stay within the recommendations of the Geomembrane Manufacturer.

(L) Excessive overheating of the geomembrane shall not be permitted. Excessive overheating includes, but is not limited to: 1) Seaming temperature or seaming rates that cause deformation or visible warping of the top or bottom surface of the geomembrane seam area 2) Seaming temperatures in excess of the recommendations of the Geomembrane Manufacturer.

3.05 TESTING OF WELDS

(A) Vacuum Testing:

1. Energize the vacuum pump.
2. Wet a strip of geomembrane/HDPE liner approximately 12 inches by 48 inches with a soapy solution.
3. Place the vacuum box assembly over the wetted area.
4. Close the bleed valve and open the vacuum valve.
5. Ensure that the leak tight seal is created.
6. For a period of about 5 to 10 seconds, examine the geomembrane through the viewing window for the propagation of soap bubbles.
7. After 5 to 10 seconds, close the vacuum valve and open the bleed valve, move the box over the adjoining area with a minimum 3 inch overlap, and repeat.
8. All areas where soap bubbles appear will be marked and repaired per section 3.06.
9. Vacuum tested seams shall be recorded in the Geomembrane

Installer's Daily Field Log.

(B) Air Pressure Testing (Double Fusion Seams)

1. Seal both ends of the seam to be tested.
2. Insert needle or other approved pressure feed device into the tunnel created by the fusion weld.
3. Energize the air pump to a pressure between **20 and 30 psi**, close valve, and hold pressure for approximately **5 minutes**. See below acceptable values.

Sheet Thickness	Min. Pressure	Max. Pressure	Pressure Drop
40 mil.	20 psi	30 psi	4 psi

4. If loss of pressure exceeds the values listed above, or does not stabilize, locate faulty area and repair in accordance with Section 3.06.
5. Release air pressure by puncturing seam to assure there is no blockage in the air channel and verify tht the full seam has been pressurized.
6. Remove needle or other approved pressure feed device and seal.
7. Record pressure tested seams in the Daily Field Log.

3.06 DAMAGE REPAIR

(A) Any damage in the form of cuts or tears, including those done for seam testing, shall be identified and repaired by the Installer by cutting a patch of unused geomembrane and placing over the area.

(B) The damaged area shall be removed of all dirt, debris, and moisture. A patch of geomembrane shall be cut to fit over the damaged area and to extend one foot in all directions around it. All patches shall be rounded at the corners so that the repair can be completed with continuous extrusion welding.

(C) Damaged geomembrane areas shall not be repaired by the application of a bead extrudate, unless approved by the ENGINEER.

(D) Extrusion welds shall not be placed over previously seamed area in an attempt to repair fusion seams.

(E) If patching of the geomembrane becomes excessive, the entire roll or panel shall be rejected.

END OF SECTION 33 47 13